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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the semiconductor device of flip chip structure.

[0002]

[Description of the Prior Art] In order to realize small electronic equipment, they are miniaturized electronic parts attaining advanced features and high integration. Electronic parts, for example, a semiconductor device, are attaining much more miniaturization by including this in a direct wiring substrate using the bare chip which does not carry out sheathing, although what generally carried out sheathing by resin is used. This seed semiconductor device is explained from drawing 7 . In drawing, 1 is a semi-conductor pellet and forms many bump electrodes 3 along the 1 principal-plane periphery of the semi-conductor substrate 2 in which the semiconductor device (not shown) was formed inside. 4 is a wiring substrate and forms the pad electrode 6 in one principal plane of the insulating substrates 5, such as thermosetting resin, corresponding to the bump electrode 3 of the semi-conductor pellet 1. It was made to counter so that the bump electrode 3 and the pad electrode 6 may carry out the polymerization of this semi-conductor pellet 1 and the wiring substrate 4, and between each opposed face is pasted up with resin 7 in the condition of having pressurized the polymerization section and having made it connecting electrically. In this semiconductor device, it forms by plating or the ball bonding method, and it is maintaining the electrical installation of the polymerization section of each electrode at the copper layer by the volumetric shrinkage at the time of the plastic deformation of the bump electrode 3, and hardening of resin 7, using the pad electrode 6 as the structure which plated hard nickel and covered gold thinly further, using gold as an electrode material of the bump electrode 3. Although the semiconductor device of such structure can be integrated highly thinly, the temperature rise of the part on which the calorific value per opposite side unit volume was also large, and mounted the semi-conductor pellet 1 of the wiring substrate 4 is locally carried out to an elevated temperature. Therefore, although this semiconductor device produces curvature according to the difference of the coefficient of thermal expansion of the semi-conductor pellet 1 and the wiring substrate 4, since the whole surface of the semi-conductor pellet 1 has pasted up with resin 7, electrical installation is maintained although the minute distance location gap of the bump electrode 3 and the pad electrode 6 is carried out in the direction of a polymerization side. However, since resin 7 is wide opened outside out of the side attachment wall of the semi-conductor

pellet 1, When a crack detailed in a part with small bond strength existing in the adhesion interface of resin 7 arises, Crack A advances within between [of the semi-conductor pellet 1 and the wiring substrate 4] opposed faces, the semi-conductor pellet 1 was made to exfoliate from the wiring substrate 4, as shown in drawing 8 , the contact pressure of the bump electrode 3 and the pad electrode 6 was reduced, and there was a problem of spoiling electrical installation. On the other hand, the semiconductor device of the structure shown in drawing 9 is indicated by JP,6-45402,A. In drawing, 8 is a rectangular semi-conductor pellet, as shown in drawing 10 , it forms many minor diameter bump electrodes 10 in the periphery of one principal plane of the semi-conductor substrate 9 on a straight line, and it forms the bump electrode 11 of path size in the array direction both ends located in the corner section. Each bump electrodes 10 and 11 consist of solder, and are spherically formed at the time of semi-conductor pellet 8 independent one. 12 is a wiring substrate, as shown in drawing 11 , it is the thing in which the pad electrodes 14 and 15 by the electric conduction film were formed on the insulating substrate 13, and each pad electrodes 14 and 15 are formed with the dimension corresponding to the location which corresponds with the bump electrodes 10 and 11 of the semi-conductor pellet 8. Each pad electrodes 14 and 15 also consist of solder, at the time of wiring substrate 12 independent one, a flat-surface configuration is a rectangle-like and the pad electrode 15 of path size is formed in the flat side in the shape of [with the pad electrode 14 of **** a little smaller than the bump electrode 10] a ball. In addition, the illustration abbreviation is carried out although a substrate electrode is formed in each electrodes 10, 11, 14, and 15. By carrying out opposite arrangement of the semi-conductor pellet 8, carrying out the polymerization of each electrode, and supplying into an elevated-temperature ambient atmosphere on this wiring substrate 12, as shown in drawing 12 , the solder of each electrode material is melted and the semiconductor device of the structure which carried out electrical installation with the solder electrode 16 unified as shown in drawing 9 is obtained. This semiconductor device makes path size the bump electrode 11 located in the corner section of the semi-conductor pellet 8 from the bump electrode 10 of other parts, the location gap at the time of solder melting avoids, although the problem produced by thermal expansion does not cope with, the bump electrode located in the corner section of a semi-conductor pellet can make into path size, the connection resilience of a semi-conductor pellet and a wiring substrate can raise, and it is thought possible applying this technique to drawing 7 equipment.

[0003]

[Problem(s) to be Solved by the Invention] However, although the semi-conductor pellet 8 and the wiring substrate 12 are directly connected to thermal connection by the solder electrode 16 with drawing 9 equipment, since thermal connection is made by radiation through air, other parts become inadequate and a temperature rise is remarkable [parts / heat dissipation of the semi-conductor pellet 8]. Therefore, if it is unsuitable for the semiconductor device accompanied by big generation of heat and a temperature rise is remarkable, the stress of thermal expansion and contraction will concentrate on the solder electrode located in the corner section which is most distant from the flat-surface core of the semi-conductor pellet 8. Therefore, even if it made the solder electrode of the corner section into path size to the semi-conductor pellet 8 in the thing using an insulating material with a big coefficient of thermal expansion as a wiring substrate 12, when thermal expansion and contraction were repeated, the crack was produced between the solder

electrode and the substrate electrode, and the problem of spoiling electrical installation was still left behind.

[0004]

[Means for Solving the Problem] This invention is what was proposed for the purpose of solution of the technical problem which the semiconductor device shown in drawing 7 has. The semi-conductor pellet which formed many bump electrodes along the periphery of one principal plane, said bump electrode, and the wiring substrate in which the pad electrode was formed in the corresponding location are made to counter. In the semiconductor device of flip chip structure on which the polymerization of said bump electrode and pad electrode was carried out, they were electrically connected to, and between the opposed faces of a semi-conductor pellet and a wiring substrate was pasted up by resin. The path of the bump electrode located in each corner section of said semi-conductor pellet and a wiring substrate and a pad electrode is made larger than the path of the bump electrode located in other fields, and a pad electrode. The semiconductor device characterized by making the resin on which a semi-conductor pellet and a wiring substrate are pasted up extend to a way field outside a path size electrode is offered.

[0005]

[Embodiment of the Invention] The semiconductor device by this invention makes the semi-conductor pellet which has a bump electrode, and the wiring substrate in which the pad electrode was formed counter. It is a thing about the semiconductor device on which the polymerization of each electrode was carried out, it was electrically connected to, and between the opposed faces of a semi-conductor pellet and a wiring substrate was pasted up by resin. Although the path of the bump electrode located in each corner section of a semi-conductor pellet and a wiring substrate and a pad electrode is made larger than the path of the bump electrode located in other fields, and a pad electrode and it is characterized by making the resin on which a semi-conductor pellet and a wiring substrate are pasted up extend to a way field outside a path size electrode. A path size electrode can also make path size two or more electrodes it not only forms uniquely, but adjoined each other and located in the corner section. Moreover, the bump electrode and pad electrode which are located in the corner section can also be used as the dummy electrode which is unrelated to the semiconductor device inside a semi-conductor pellet.

[0006]

[Example] The example of this invention is explained from drawing 1 below. In drawing, the explanation which gives the same sign to the same object as drawing 7, and overlaps is omitted. Carrying out difference to the drawing 7 equipment in drawing forms the bump electrode 17 of path size from the bump electrode 3 formed in the principal plane corner section of the semi-conductor pellet 1 along other principal plane peripheries as shown in drawing 2. It is having only made the resin 7 on which having formed the pad electrode 18 of path size in the path size bump electrode 17 on the wiring substrate 4 and the location which counters as shown in drawing 3, and the semi-conductor pellet 1 and the wiring substrate 4 are pasted up extend to the way field B outside the path size electrodes 17 and 18. Moreover, similarly height is set up by paths only differing, and it is set as the height same [the bump electrodes 3 and 17] only by paths differing as the pad electrodes 6 and 18. In the case of the semi-conductor pellet of 15mm angle, as a concrete example of each electrode, the path size bump electrode 17 of the **** bump electrode 3 is 150micrometerx150micrometer at 100micrometerx100micrometer and array interval of 200

micrometers. It is formed in height of 60 micrometers of both gold plate, and the pad electrodes 6 and 18 of the wiring substrate 4 form a nickel layer with a thickness of 3-5 micrometers on a copper circuit pattern with a thickness of 18 micrometers. It is what furthermore formed the gold plate layer with a thickness of 0.03-0.05 micrometers, and is set as the same flat-surface configuration as a corresponding bump electrode, and the dimension. While the wiring substrate 4 is laid on a flat side, and is heated by about 80 degrees C, and position and the bump electrode carries out the polymerization of the semi-conductor pellet 1 held by adsorption means to have a heating means so that the pad electrode on the wiring substrate 4 may lap, and supplying liquefied resin 7 between the semi-conductor pellet 1 and the wiring substrate 4, heating at about 200 degrees C and stiffening resin 7, between opposed faces is pasted up. The fluidized resin 7 is opened to the way field B outside the path size bump electrode 17, and it is made for the whole rear-face surface of the semi-conductor pellet 1 to paste the wiring substrate 4 at this time. consequently, in the corner section of the semi-conductor pellet 1 which the stress produced by thermal expansion concentrates most, resin 7 carries out covering adhesion of the side attachment wall of the semi-conductor pellet 1 and the bump electrode 17 of path size, and the wiring substrate 4 continuously, moreover, since the area of the side attachment wall of the path size bump electrode 17 is larger than the area of the bump electrode 3 of ****, bond strength boils it markedly and it improves. Moreover, as shown in drawing 4, the minute crack C is produced to the resin field B of the corner section of the semi-conductor pellet 1, and even if this tends to grow and it is going to go on inside the semi-conductor pellet 1, advance of a crack is prevented by short distance with the bump electrode 17 of path size. Also where advance of this crack is stopped with the path size bump electrode 17, since the perimeter has pasted up with resin 7, spacing of the semi-conductor pellet 1 and the wiring substrate 4 is maintained, the contact pressure of other **** bump electrodes 3 and the pad electrode 6 is maintained, and the polymerization section of the bump electrode 17 and the pad electrode 18 can maintain electrical installation. Drawing 5 shows the modification of this invention. In drawing, the explanation which gives the same sign to the same object as drawing 7 and drawing 1, and overlaps is omitted. It only carries out difference in drawing that made into path size the bump electrode 19 contiguous to the bump electrode 17 of the path size formed in the array direction both ends of the bump electrode 3 like the bump electrode 17 as shown in drawing 6, and the pad electrode of the wiring substrate 4 also formed the pad electrodes 18 and 20 corresponding to the path size bump electrodes 17 and 19 in path size. By this, the area of the closure field by the resin 7 of the corner section of the semi-conductor pellet 1 can be reduced, the distance from the external surface of resin 7 to the path size electrodes 17, 18, 19, and 20 can be shortened, even if it produces a minute crack in the external surface and adhesion interface of resin 7, the advance can be prevented by short distance, and exfoliation of the semi-conductor pellet 1 can be prevented. In addition, although each path size electrode was set as the same configuration and the dimension in the example shown in drawing 6, the path size electrode 19 which adjoins the **** electrode 3 as shown, for example in drawing 7 is the same width of face as the **** electrode 3, and can be set as arbitration, such as setting up die length similarly to the path size electrode 17 of both ends. Moreover, although a path size electrode can be used as a terminal with which the principal current of a power supply terminal, an earth terminal, etc. flows when connecting the path size bump electrodes 17 and 19 with the internal component of the semi-conductor pellet 1 electrically and making

external connection with the pad electrodes 18 and 20, it not only connects this path size electrode internally, but it can use it as a dummy electrode electrically separated from the internal component. in this case, two or more dummy bump electrodes -- one by one -- electric -- connecting -- this serial -- the short circuit condition by the conductor is supervised by the pad electrode side, and before the electrical installation of a **** electrode is spoiled by detecting having changed from the short circuit condition to the open condition, it can also use as a sensor to detect that the semi-conductor pellet 1 exfoliated.
[0007]

[Effect of the Invention] According to this invention, even if it produces a minute crack to the resin on which a semi-conductor pellet and a wiring substrate are pasted up, advance of this crack can be prevented by short distance, and the electrical installation of the bump electrode of **** and pad electrode by which pressure-welding connection is made can be kept above.

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] The semi-conductor pellet which formed many bump electrodes along the periphery of one principal plane, said bump electrode, and the wiring substrate in which the pad electrode was formed in the corresponding location are made to counter. In the semiconductor device on which the polymerization of said bump electrode and pad electrode was carried out, they were electrically connected to, and between the opposed faces of a semi-conductor pellet and a wiring substrate was pasted up by resin The path of the bump electrode located in each corner section of said semi-conductor pellet and a wiring substrate and a pad electrode is made larger than the path of the bump electrode located in other fields, and a pad electrode. The semiconductor device characterized by making the resin on which a semi-conductor pellet and a wiring substrate are pasted up extend to a way field outside a path size electrode is offered.

[Claim 2] The semiconductor device according to claim 1 characterized by making larger than the path of the bump electrode located in other fields, and a pad electrode the path of two or more bump electrodes adjoined each other and located in each corner section of said semi-conductor pellet and a wiring substrate, and a pad electrode.

[Claim 3] The semiconductor device according to claim 1 characterized by using as a dummy electrode the bump electrode and pad electrode which are located in the corner section.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The sectional side elevation of the semiconductor device in which the example of this invention is shown

[Drawing 2] The perspective view of the semi-conductor pellet used for drawing 1 equipment

[Drawing 3] The important section perspective view of the wiring substrate used for drawing 1 equipment

[Drawing 4] The partial expansion sectional side elevation explaining the effectiveness of drawing 1 equipment

[Drawing 5] The partial expansion sectional side elevation showing other examples of this invention

[Drawing 6] The part plan of a semi-conductor pellet used for drawing 5 equipment

[Drawing 7] The sectional side elevation showing an example of the conventional semiconductor device

[Drawing 8] The partial expansion sectional side elevation explaining the technical problem of drawing 7 equipment of a semi-conductor pellet

[Drawing 9] The sectional side elevation showing the semiconductor device with which the former differs

[Drawing 10] The perspective view of the semi-conductor pellet used for drawing 9 equipment

[Drawing 11] The important section perspective view of the wiring substrate used for drawing 9 equipment

[Drawing 12] The sectional side elevation explaining the manufacture approach of drawing 9 equipment

[Description of Notations]

1 Semi-conductor Pellet

3 Bump Electrode (**** Pad Electrode)

4 Wiring Substrate

6 Pad Electrode (**** Pad Electrode)

7 Resin

17 Path Size Bump Electrode

18 Path Size Pad Electrode

[Translation done.]

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ABSTRACT:

PROBLEM TO BE SOLVED: To keep electric connection between the bump electrodes and pad electrodes of small sizes which are pressure-connected, by eliminating the progress of a crack in a short distance even if the micro crack is developed in resin adhering a semiconductor pellet to a wiring board.

SOLUTION: In a semiconductor device, a semiconductor pellet 1 where the multiple bump electrodes 3 are formed along the peripheral edge of one main face is made to face the wiring board 4 where the pad electrodes 6 are formed in positions corresponding to the bump electrodes 3. The bump electrodes 3 and the pad electrodes 6 are stacked and are electrically connected. The confronted faces of the semiconductor pellet 1 and the wiring board 4 are adhered by resin 7. The sizes of the bump electrodes 17 and the pad electrodes 18 positioned at the corners of the semiconductor pellet 1 and the wiring board 4 are made larger than those of the bump electrodes 3 and the pad electrodes 6 positioned in the other areas. Resin 7 making the semiconductor pellet 1

adhere to the wiring board 4 is extended to the outer area of the large electrodes 17.

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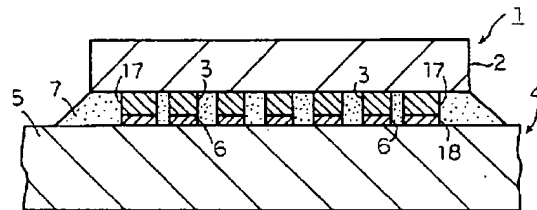
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(54)【発明の名称】 半導体装置

(57)【要約】

【課題】半導体ペレットと配線基板とを接着する樹脂にクラックが生じるとバンパ電極とパッド電極の圧接圧力が低下して電氣的接続が損なわれる。

【解決手段】一主面の周縁に沿って多数のバンパ電極3を形成した半導体ペレット1と前記バンパ電極3と対応する位置にパッド電極6を形成した配線基板4とを対向させ、前記バンパ電極3とパッド電極6とを重合させて電氣的に接続し、半導体ペレット1と配線基板4の対向面間を樹脂7にて接着した半導体装置において、前記半導体ペレット1及び配線基板4のそれぞれのコーナ部に位置するバンパ電極17及びパッド電極18の径を他の領域に位置するバンパ電極3及びパッド電極6の径より大きくし、半導体ペレット1と配線基板4とを接着する樹脂7を径大電極17の外方領域まで延在させたことを特徴とする半導体装置を提供する。



【特許請求の範囲】

【請求項1】一主面の周縁に沿って多数のバンパ電極を形成した半導体ベレットと前記バンパ電極と対応する位置にパッド電極を形成した配線基板とを対向させ、前記バンパ電極とパッド電極とを重合させて電気的に接続し、半導体ベレットと配線基板の対向面間を樹脂にて接着した半導体装置において、

前記半導体ベレット及び配線基板のそれぞれのコーナ部に位置するバンパ電極及びパッド電極の径を他の領域に位置するバンパ電極及びパッド電極の径より大きくし、半導体ベレットと配線基板とを接着する樹脂を径大電極の外方領域まで延在させたことを特徴とする半導体装置を提供する。

【請求項2】前記半導体ベレット及び配線基板のそれぞれのコーナ部に隣り合って位置する複数のバンパ電極及びパッド電極の径を他の領域に位置するバンパ電極及びパッド電極の径より大きくしたことを特徴とする請求項1に記載の半導体装置。

【請求項3】コーナ部に位置するバンパ電極及びパッド電極をダミー電極とすることを特徴とする請求項1に記載の半導体装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明はフリップチップ構造の半導体装置に関する。

【0002】

【従来の技術】小型の電子機器を実現するために電子部品は高機能化、高集積化を図りつつ小型化されている。電子部品、例えば半導体装置は一般的に樹脂で外装したものが用いられるが、外装しないベアチップを用い、これを直接配線基板に組み込むことにより一層の小型化を図っている。この種半導体装置を図7から説明する。図において、1は半導体ベレットで、内部に半導体素子（図示せず）を形成した半導体基板2の一主面周縁に沿ってバンパ電極3を多数形成している。4は配線基板で、熱硬化性樹脂などの絶縁基板5の一主面に半導体ベレット1のバンパ電極3と対応してパッド電極6を形成している。この半導体ベレット1と配線基板4とをバンパ電極3とパッド電極6が重合するように対向させ、重合部を加圧して電気的に接続させた状態で、各対向面間を樹脂7により接着している。この半導体装置では、バンパ電極3の電極材料として金を用い、メッキやボールボンディング法により形成し、パッド電極6は銅層に硬質のニッケルをメッキしさらに金を薄く被覆した構造として、バンパ電極3の塑性変形と樹脂7の硬化時の体積収縮により各電極の重合部の電気的接続を保っている。このような構造の半導体装置は薄く高集積化できるが、反面単位体積当たりの発熱量も大きく、配線基板4の半導体ベレット1をマウントした部分を局所的に高温に温度上昇させる。そのため、半導体ベレット1と配線基板

4の熱膨張率の差によりこの半導体装置は反りを生じるが、半導体ベレット1の全面が樹脂7により接着されているため、バンパ電極3とパッド電極6とは重合面方向に微小距離位置ずれするものの、電気的接続は保たれる。しかしながら、樹脂7は半導体ベレット1の側壁外で外部に開放されるため、樹脂7の接着界面に接着強度の小さい部分が存在したり、微細なクラックが生じた場合、図8に示すようにクラックAが半導体ベレット1と配線基板4の対向面間内に行き、半導体ベレット1を配線基板4から剥離させ、バンパ電極3とパッド電極6の圧接力を低下させ電気的接続を損なうという問題があった。一方、特開平6-45402号公報には図9に示す構造の半導体装置が開示されている。図において、8は矩形の半導体ベレットで、図10に示すように半導体基板9の一主面の周縁に一直線上に多数の小径バンパ電極10を形成し、コーナ部に位置する配列方向両端には径大のバンパ電極11を形成している。各バンパ電極10、11は半田からなり半導体ベレット8単独の時には球状に形成されている。12は配線基板で、図11に示すように絶縁基板13上に導電膜によるパッド電極14、15を形成したもので、各パッド電極14、15は半導体ベレット8のバンパ電極10、11と対応する位置に、対応する寸法で形成されている。各パッド電極14、15も半田からなり配線基板12単独の時には平面形状は矩形状で、径小のパッド電極14はバンパ電極10よりやや小さい球状に、径大のパッド電極15は平坦面に形成されている。尚、各電極10、11、14、15には下地電極が形成されるが図示省略している。この配線基板12上に図12に示すように半導体ベレット8を対向配置して各電極を重合させ高温雰囲気中に供給することにより各電極材料の半田を溶かし、図9に示すように一体化した半田電極16により電気的接続をした構造の半導体装置を得る。この半導体装置は半導体ベレット8のコーナ部に位置するバンパ電極11を他の部分のバンパ電極10より径大にして、半田熔融時の位置ずれを回避するもので、熱膨張により生じる問題に対応するものではないが半導体ベレットのコーナ部に位置するバンパ電極を径大にして半導体ベレットと配線基板の接続強度を高めることができ、この技術を図7装置に適用することは可能と考えられる。

【0003】

【発明が解決しようとする課題】しかしながら、図9装置では半導体ベレット8と配線基板12は熱的接続に半田電極16によって直接的に接続されているが、他の部分は空気を介して輻射により熱的接続がなされるため、半導体ベレット8の放熱は不十分となり温度上昇が著しい。そのため、大きな発熱を伴う半導体装置には不向きで、温度上昇が著しいと半導体ベレット8の平面中心からもっとも離れたコーナ部に位置する半田電極に熱膨張、収縮の応力が集中する。そのため配線基板12とし

て半導体ベレット8に対して熱膨張係数の大きな絶縁材料を用いたものでは、コーナ部の半田電極を径大にしても熱膨張、収縮を繰り返すと半田電極と下地電極との間でクラックを生じ、電氣的接続を損なうという問題は依然として残されていた。

【0004】

【課題を解決するための手段】本発明は図7に示す半導体装置が有する課題の解決を目的として提案されたもので、一主面の周縁に沿って多数のバンパ電極を形成した半導体ベレットと前記バンパ電極と対応する位置にパッド電極を形成した配線基板とを対向させ、前記バンパ電極とパッド電極とを重合させて電氣的に接続し、半導体ベレットと配線基板の対向面間を樹脂にて接着したフリップチップ構造の半導体装置において、前記半導体ベレット及び配線基板のそれぞれのコーナ部に位置するバンパ電極及びパッド電極の径を他の領域に位置するバンパ電極及びパッド電極の径より大きくし、半導体ベレットと配線基板とを接着する樹脂を径大電極の外方領域まで延在させたことを特徴とする半導体装置を提供する。

【0005】

【発明の実施の形態】本発明による半導体装置は、バンパ電極を有する半導体ベレットとパッド電極を形成した配線基板とを対向させ、各電極を重合させて電氣的に接続し、半導体ベレットと配線基板の対向面間を樹脂にて接着した半導体装置に関するもので、半導体ベレット及び配線基板のそれぞれのコーナ部に位置するバンパ電極及びパッド電極の径を他の領域に位置するバンパ電極及びパッド電極の径より大きくし、半導体ベレットと配線基板とを接着する樹脂を径大電極の外方領域まで延在させたことを特徴とするが、径大電極はコーナ部で唯一形成するだけでなく、隣り合って位置する複数の電極を径大にすることも出来る。また、コーナ部に位置するバンパ電極及びパッド電極は半導体ベレット内部の半導体素子とは関係のないダミー電極とすることも出来る。

【0006】

【実施例】以下に本発明の実施例を図1から説明する。図において、図7と同一物には同一符号を付し重複する説明を省略する。図中図7装置と相異なるのは図2に示すように半導体ベレット1の主面コーナ部に他の主面周縁に沿って形成したバンパ電極3より径大のバンパ電極17を形成し、図3に示すように配線基板4上の径大バンパ電極17と対向する位置に径大のパッド電極18を形成したことと、半導体ベレット1と配線基板4とを接着する樹脂7を径大電極17、18の外方領域Bまで延在させたことのみである。またバンパ電極3、17は径が異なるだけで、高さは同じに設定され、パッド電極6、18も径が異なるだけで同じ高さに設定されている。電極それぞれの具体的例として、15mm角の半導体ベレットの場合、径小バンパ電極3は100 μ m×100 μ m、配列間隔200 μ mに、径大バンパ電極17

は150 μ m×150 μ mで、共に金メッキにより高さ60 μ mに形成され、配線基板4のパッド電極6、18は厚さ18 μ mの銅の配線パターン上に厚さ3～5 μ mのニッケル層を形成し、さらに厚さ0.03～0.05 μ mの金メッキ層を形成したもので、対応するバンパ電極と同じ平面形状、寸法に設定されている。配線基板4は平坦面上に載置されて80℃程度に加熱され、加熱手段を有する吸着手段により保持された半導体ベレット1を、そのバンパ電極が配線基板4上のパッド電極とが重なるように位置決めして重合させ、半導体ベレット1と配線基板4の間に液状樹脂7を供給して200℃程度に加熱して樹脂7を硬化させるとともに対向面間を接着する。この時、流動化した樹脂7を径大バンパ電極17の外方領域Bまで広げ、半導体ベレット1の裏面全面が配線基板4に接着されるようにする。この結果、熱膨張により生じる応力が最も集中する半導体ベレット1のコーナ部で、樹脂7は半導体ベレット1、径大のバンパ電極17の側壁、配線基板4を連続して被覆接着し、しかも径大バンパ電極17の側壁の面積は径小のバンパ電極3の面積よりも広いため接着強度が格段に向上する。また、図4に示すように半導体ベレット1のコーナ部の樹脂領域Bに微小クラックCを生じ、これが成長して半導体ベレット1の内部に進行しようとしても、径大のバンパ電極17によってクラックの進行が短距離で阻止される。このクラックの進行が径大バンパ電極17で停止せられた状態でも、バンパ電極17とパッド電極18の重合部は全周が樹脂7によって接着されているため、半導体ベレット1と配線基板4の間隔が保たれ、他の径小バンパ電極3とパッド電極6の圧接力が維持され電氣的接続を保つことが出来る。図5は本発明の変形例を示す。図において、図7、図1と同一物には同一符号を付し重複する説明を省略する。図中相異なるのは、図6に示すようにバンパ電極3の配列方向両端に形成した径大のバンパ電極17と隣接するバンパ電極19をバンパ電極17と同様に径大とし、配線基板4のパッド電極も径大バンパ電極17、19に対応するパッド電極18、20を径大に形成したことのみである。これにより、半導体ベレット1のコーナ部の樹脂7による封止領域の面積が縮小され、樹脂7の外周から径大電極17、18、19、20までの距離が短縮され、樹脂7の外周や接着界面に微小クラックを生じてもその進行を短距離で阻止でき、半導体ベレット1の剥離を防止できる。尚、図6に示す例では各径大電極を同じ形状、寸法に設定したが、例えば図7に示すように径小電極3と隣り合う径大電極19は径小電極3と同じ幅で、長さを両端の径大電極17と同じに設定するなど任意に設定できる。また、径大バンパ電極17、19を半導体ベレット1の内部素子と電氣的に接続しパッド電極18、20により外部接続する場合には、径大電極を電源端子や接地端子などの主電流が流れる端子として用いることが出来るが、この径大

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電極は内部接続するだけでなく、内部素子から電氣的に分離されたダミー電極として用いることもできる。この場合、複数のダミーバンプ電極を順次電氣的に接続し、この直列導体による短絡状態をパッド電極側で監視し、短絡状態から開放状態に変化したことを検知することによって径小電極の電氣的接続が損なわれる前に半導体ベレット1が剥離したことを検知するセンサとして用いることも出来る。

【0007】

【発明の効果】以上のように本発明によれば、半導体ベレットと配線基板を接着する樹脂に微小クラックを生じても、このクラックの進行を短距離で阻止でき、圧接接続される径小のバンプ電極とパッド電極との電氣的接続を保つことが出来る。

【図面の簡単な説明】

【図1】 本発明の実施例を示す半導体装置の側断面図

【図2】 図1装置に用いられる半導体ベレットの斜視図

【図3】 図1装置に用いられる配線基板の要部斜視図

【図4】 図1装置の効果を説明する部分拡大側断面図

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【図5】 本発明の他の実施例を示す部分拡大側断面図

【図6】 図5装置に用いられる半導体ベレットの部分平面図

【図7】 従来の半導体装置の一例を示す側断面図

【図8】 図7装置の課題を説明する半導体ベレットの部分拡大側断面図

【図9】 従来の異なる半導体装置を示す側断面図

【図10】 図9装置に用いられる半導体ベレットの斜視図

【図11】 図9装置に用いられる配線基板の要部斜視図

【図12】 図9装置の製造方法を説明する側断面図

【符号の説明】

1 半導体ベレット

3 バンプ電極（径小パッド電極）

4 配線基板

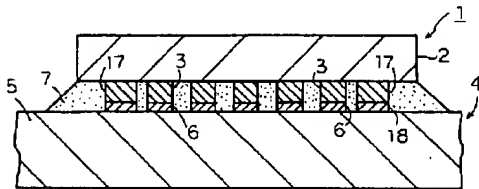
6 パッド電極（径小パッド電極）

7 樹脂

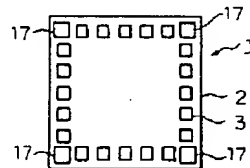
17 径大バンプ電極

20 18 径大パッド電極

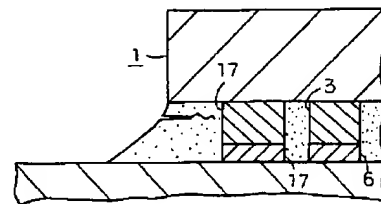
【図1】



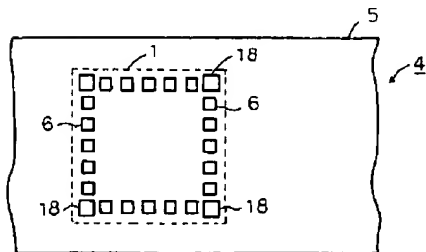
【図2】



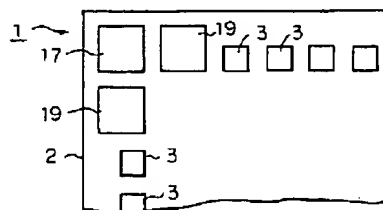
【図4】



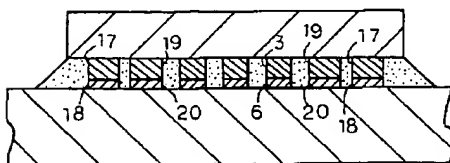
【図3】



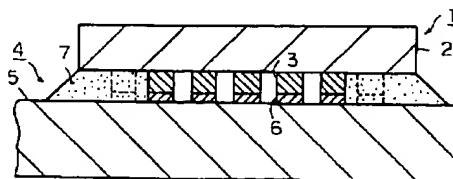
【図6】



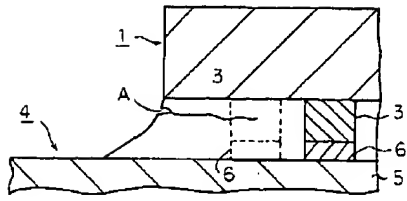
【図5】



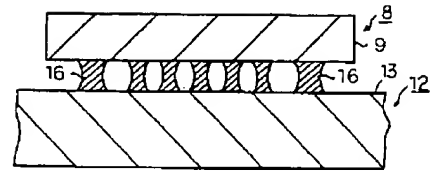
【図7】



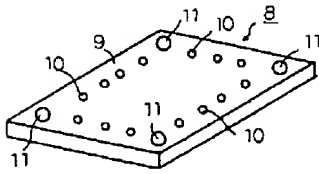
【図8】



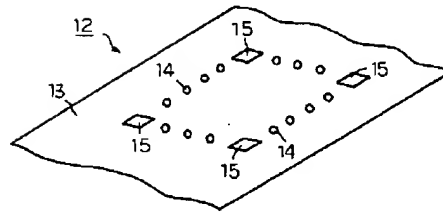
【図9】



【図10】



【図11】



【図12】

